

ORIGINAL

LATHAM & WATKINS

ATTORNEYS AT LAW

1001 PENNSYLVANIA AVE., N.W., SUITE 1300
WASHINGTON, D.C. 20004-2505
TELEPHONE (202) 637-2200
FAX (202) 637-2201
TLX 590775
ELN 62793269

PAUL R. WATKINS (1899-1973)
DANA LATHAM (1898-1974)

CHICAGO OFFICE
SEARS TOWER, SUITE 5800
CHICAGO, ILLINOIS 60606
TELEPHONE (312) 876-7700
FAX (312) 993-9767

LONDON OFFICE
ONE ANGEL COURT
LONDON EC2R 7HJ ENGLAND
TELEPHONE + 44-71-374 4444
FAX + 44-71-374 4460

LOS ANGELES OFFICE
633 WEST FIFTH STREET, SUITE 4000
LOS ANGELES, CALIFORNIA 90071-2007
TELEPHONE (213) 486-1234
FAX (213) 891-8763

MOSCOW OFFICE
113/1 LENINSKY PROSPECT, SUITE C200
MOSCOW 117198 RUSSIA
TELEPHONE + 7-503 956-5555
FAX + 7-503 956-5556

BY HAND DELIVERY

William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W., Room 222
Washington, D.C. 20554

NEW JERSEY OFFICE
ONE NEWARK CENTER
NEWARK, NEW JERSEY 07101-3174
TELEPHONE (201) 639-1234
FAX (201) 639-7298

NEW YORK OFFICE
885 THIRD AVENUE, SUITE 1000
NEW YORK, NEW YORK 10022-4802
TELEPHONE (212) 906-1200
FAX (212) 751-4864

ORANGE COUNTY OFFICE
650 TOWN CENTER DRIVE, SUITE 2000
COSTA MESA, CALIFORNIA 92626-1925
TELEPHONE (714) 540-1235
FAX (714) 755-8290

SAN DIEGO OFFICE
701 "B" STREET, SUITE 2100
SAN DIEGO, CALIFORNIA 92101-8197
TELEPHONE (619) 236-1234
FAX (619) 696-7419

SAN FRANCISCO OFFICE
505 MONTGOMERY STREET, SUITE 1900
SAN FRANCISCO, CALIFORNIA 94111-2562
TELEPHONE (415) 391-0600
FAX (415) 395-8095

March 7, 1995

RECEIVED

MAR 7 1995

DOCKET FILE COPY ORIGINAL

FEDERAL COMMUNICATIONS COMMISSION
OFFICE SECRETARY

~~CONFIDENTIAL~~

Re: Preparation for World Radiocommunications Conferences
IC Docket No. 94-31
Erratum to Comments of Hughes Space and Communications Company
and Hughes Communications Galaxy, Inc.

Dear Mr. Caton:

This Erratum is filed on behalf of Hughes Space and Communications Company and Hughes Communications Galaxy, Inc. (collectively, "Hughes"), with respect to Hughes' Comments in the above-captioned proceeding, filed March 6, 1995. Due to computer problems, the summary and table of contents could not be filed with the Comments on March 6, and certain typographical errors in the text could not be corrected before filing.

Enclosed for filing are an original and four copies of a corrected version of Hughes' Comments, with table of contents and summary, and with the following corrections:

Page

Correction

Page 3

In the last sentence: (i) move the phrase "in terms of cost and service flexibility" to just after the phrase "In any event," and (ii) change the word "used" to "use."

No. of Copies rec'd 054
List A B C D E

William F. Caton
March 7, 1995
Page 2

- Page 5 In the first sentence after the heading for Section B., insert the word "that" between the words "acknowledges" and "non-GSO."
- Page 6 In the fourth sentence of the first full paragraph, replace the word "some" with the word "same."
- In footnote 4, replace the word "all" in the phrase "significant amount of all spectrum" with the word "the."
- Page 8 In footnote 6, add the letter "s" at the end of the abbreviation "Doc." in the citation.
- Page 9 In the second conclusion, labeled "(2)," delete the comma after the word "acceptable."
- Page 12 In footnote 9, underline the abbreviation "e.g." before the citation to the US CPM document.
- Page 17 In the first sentence below the heading for Section IV, replace the word "Notice" with the defined term "Second NOI."
- Page 18 On the second line on the page, replace the word "Notice" with the defined term "Second NOI."
- Page 19 In footnote 16, delete the second "M" in "CPMM-95/6" in the second citation.
- Page 21 In the last sentence, change the letter "c" in the word "commission" to upper case.

Please contact me if there are any questions.

Sincerely yours,


John P. Janka

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

RECEIVED
MAR 7 1995
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

In the Matter of)
)
)

Preparation for International)
Telecommunication Union World)
Radiocommunication Conferences)
_____)

IC Docket No. 94-31

DOCKET FILE COPY ORIGINAL

COMMENTS OF HUGHES SPACE AND COMMUNICATIONS COMPANY
AND HUGHES COMMUNICATIONS GALAXY, INC.

John P. Janka
Raymond B. Grochowski
LATHAM & WATKINS
1001 Pennsylvania Avenue, N.W.
Suite 1300
Washington, D.C. 20004-2505
(202) 637-2200

March 6, 1995

Summary

Hughes Space and Communications Company ("HSC"), a unit of Hughes Aircraft Company ("HAC"), and Hughes Communications Galaxy, Inc. ("HCG") (collectively, "Hughes") have three primary interests in the preparation for WRC-95: (i) possible modifications to the Ka band (27.5--30.5 and 17.7-20.2 GHz) allocations to accommodate non-GSO MSS feeder links, (ii) proposed amendments to the international table of frequency allocations for the 13.75--14.0 GHz band, and (iii) the effect on the Region 2 BSS Plan of proposed changes to the Region 1 and 3 BSS Plans.

The Commission has listed a number of "candidate" frequency bands as potentially suitable for use by non-GSO MSS feeder links, including 500 MHz in each of the 17.7-20.2 and 27.5-30.0 portions of the Ka band. In addition, the Commission has proposed to eliminate the protections of Radio Regulation 2613 in each of those subbands. Hughes has serious concerns about these proposals because they could unduly constrain use of the Ka band by the GSO fixed satellite service and lead to inefficient use of the spectrum.

As the Commission is aware, the Ka band has long been considered both the next expansion band for accommodating growth in existing GSO FSS services and the location for the development of new GSO FSS broadband services. Recent interest in the Ka band for both GSO and non-GSO FSS systems has highlighted the importance of maintaining the availability of this band for satellite systems that are capable of providing broadband services.

While Hughes acknowledges that there is a pressing need to provide sufficient feeder link spectrum for non-GSO MSS satellite systems, Hughes believes that the allocation and assignment of non-GSO feeder link frequencies should be done in a manner that

maximizes the use of the available spectrum by all satellite services. To this end, Hughes urges the Commission to support the allocation below 17.7 GHz of sufficient spectrum to meet the needs of all of the U.S. Big LEO applicants and to propose no changes to the existing 20/30 GHz FSS allocations. The bands below 17.7 GHz should be the bands of "first" resort for LEO feeder links, in order to keep the Ka band available for use by GSO FSS systems that use the spectrum more efficiently than non-GSO systems.

If the Commission determines that some portion of the Ka band should be made available for non-GSO MSS feeder links, Hughes urges the Commission to base its proposals for WRC-95 on the fact that sharing between GSO FSS and non-GSO MSS feeder links is feasible with certain constraints. Hughes's sharing studies suggest that generic inter-service sharing criteria can be developed to reduce or eliminate the need for detailed inter-system coordination between GSO and non-GSO systems. While none of these operational constraints can be obtained without non-GSO MSS systems implementing some operational or hardware complexities, Hughes believes that these complexities clearly are warranted in order to achieve an efficient and equitable use of the spectrum.

To this end, the Commission should not consider deleting RR 2613, as it now applies to the Ka band. Deleting RR 2613's protection to GSO FSS systems would remove the incentive for non-GSO systems to maximize use of the spectrum by incorporating and exercising the technical means to avoid interference to GSO FSS systems. Essentially, deleting 2613 would create a first-come-first-served regime in which non-GSO systems would have absolutely no obligation to implement any of the interference reduction mechanisms needed to allow successful operation of subsequently launched GSO systems. Instead, Hughes believes that the best way to protect both GSO and non-GSO systems from

interference and maximize use of the spectrum is to develop and adopt generic sharing criteria to govern inter-service sharing. Hughes therefore urges the Commission to support a position at WRC-95 in which RR 2613 would be in force throughout the 30/20 GHz bands until generic criteria to govern inter-service sharing are defined and agreed upon.

With respect to the 13.75--14.0 GHz band, Hughes continues to support the Commission's efforts to correct an imbalance in the spectrum that is available for FSS uplinks and downlinks. Thus, it is critical to the competitiveness of the U.S. satellite industry, both at home and abroad, that the Commission adopt a position that supports primary GSO FSS use of the 13.75-14.0 GHz band.

Finally, Hughes endorses the IAC recommendations with respect to Appendices 30 and 30A, as they relate to DBS services. Hughes urges the Commission, however, in addressing new inter-regional sharing criteria, to protect Region 2 assignments as implemented. Doing so is essential in order to protect the significant investments that United States BSS operators have made in their systems to date

TABLE OF CONTENTS

	<u>Page</u>
I. Summary	i
I. Introduction	1
II. MSS Feeder Links at Ka Band	2
A. Continued Access to the Ka Band by GSO FSS Services is Essential to the Development of a Global Information Infrastructure ("GII")	3
B. Sufficient Spectrum Is Available Below 17.7 GHz to Meet Non-GSO MSS Feeder Link Needs	5
C. Codirectional Ka Band Feeder Links Should Be Permitted Only In Conjunction With the Adoption of GSO Sharing Criteria	6
E. The 29.5-30.0 and 19.7-20.2 GHz Bands Should be Excluded From Further Consideration	15
F. Proposals for WRC 95 Must Be Harmonized with Pending Domestic Spectrum Proceedings	15
III. 13.75 GHz Issues	16
IV. Appendices 30 and 30 A	17
V. Conclusion	21

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)

Preparation for International)
Telecommunication Union World)
Radiocommunication Conferences)

IC Docket No. 94-31

**COMMENTS OF HUGHES SPACE AND COMMUNICATIONS COMPANY
AND HUGHES COMMUNICATIONS GALAXY, INC.**

Hughes Space and Communications Company ("HSC"), a unit of Hughes Aircraft Company ("HAC"), and Hughes Communications Galaxy, Inc. ("HCG") (collectively, "Hughes") submit these comments in response to the Second Notice of Inquiry ("Second NOI") in this docket^{1/} regarding the 1995 World Radiocommunication Conference ("WRC-95") and future WRCs.

I. **Introduction**

HSC and HCG are leaders in the field of domestic and international satellite communications. HSC is a world-renowned manufacturer of communications satellites for both commercial and military use. HCG and its affiliates operate a fleet of domestic fixed-service communications satellites, and the first high-powered direct broadcast satellite system in the United States.

^{1/} FCC No. 95-36 (Released January 31, 1995).

HCG has a particular interest in this proceeding because it has applications pending to utilize two of the frequency bands that are being considered for discussion at WRC-95: 13.75-14.0 GHz, and the 17.7-20.2 GHz and 27.5-30.0 GHz portions of the Ka band. Last year, HCG applied to construct, launch and operate a new international satellite, Galaxy VIII(I), that will provide service using the 13.75-14.0 and 11.45-11.70 GHz bands. In 1993, HCG applied to construct and launch the SPACEWAY satellite system, a global network of GSO satellites that will provide broadband communications services at Ka band to all populated areas of the world.

As discussed in greater detail below, Hughes believes that the guiding principles for the Commission in developing U.S. proposals for WRC-95 should be the promotion of an internationally competitive United States satellite industry and the maximization of use of the spectrum that is available for satellite communications.

II. MSS Feeder Links at Ka Band

In the Second NOI, the Commission has listed a number of "candidate" frequency bands as potentially suitable for use by non-GSO MSS feeder links, including the 17.7-20.2 and 27.5-30.0 GHz portions of the Ka band. In addition to certain bands below 17.7 GHz, the Commission has proposed to make 500 MHz of the Ka band available in each direction for non-GSO MSS feeder links and to eliminate the protections contemplated by Radio Regulation 2613 in each of those subbands. Hughes has serious concerns about these proposals because they would unduly constrain use of the Ka band by the GSO fixed satellite service. This is particularly true because inter-service satellite compatibility has not been adequately considered to date, and because recent studies show that inter-service sharing between satellite systems is possible with little or no impact on service availability.

Hughes believes that the feeder link needs of non-GSO MSS systems can be met outside the Ka band. To the extent that the Commission nevertheless proposes to accommodate feeder links at Ka band, Hughes urges the Commission to consider the adoption of inter-service sharing criteria that would maximize access to this band by multiple satellite systems.

A. Continued Access to the Ka Band by GSO FSS Services is Essential to the Development of a Global Information Infrastructure ("GII")

The Ka band has long been considered both the next expansion band for accommodating growth in existing GSO FSS services and the location for the development of new GSO FSS broadband services. FSS service in the C and Ku bands has grown rapidly, and these bands now are experiencing congestion and saturation.^{2/} Recent interest in the Ka band for both GSO and non-GSO FSS systems has highlighted the importance of maintaining the availability of this band for satellite systems that are capable of providing broadband services. Insufficient spectrum now exists at C and Ku band to accommodate new and innovative FSS networks like the proposed Spaceway system. In any event, in terms of cost and service flexibility, the Ka band is a more desirable frequency band for such systems that will use inexpensive, ubiquitous terminals.

^{2/} As an example of the great demand for FSS spectrum, in the short time since WARC-92, numerous advance publications have been submitted to the ITU for FSS networks in the 13.75-14.00 GHz band that was allocated to FSS by WARC-92. Soon, only the Ka band will remain available to accommodate new FSS networks and new networks at C and Ku band will consist solely of replacement satellites. This impending shortage of FSS spectrum is of such concern that, pursuant to Resolution COM 4/10 of the 1994 Plenipotentiary, the ITU Radiocommunication Advisory Group has established a Working Group to address various aspects of the problems in gaining access to GSO FSS spectrum through the current ITU coordination and notification process.

The Ka band offers several technical advantages for broadband FSS applications over the C and Ku bands. The shorter wavelength in the higher band affords certain design advantages through a wide range of spectrum-efficient techniques, including:

- high data-rate interactive services through small dishes;
- smaller spacecraft components and hardware;
- wider information bandwidth RF components;
- higher gain antennas for the same physical size aperture, which reduce conditions for interference from or into other systems; and
- small spot beams for high ratio frequency reuse.

The inherent technical benefits of the Ka band permit FSS satellites to provide a wide variety of communications services to all parts of the world using small, ubiquitous earth stations.

Use of the Ka band by GSO FSS satellite systems will allow advanced communications services to be rapidly provided in areas (i) where such services would not otherwise be available for many years due to the inherent cost and delay in building the broadband terrestrial network, (ii) where it never will be economically feasible for a terrestrial network to be constructed, and (iii) where there is insufficient FSS spectrum available at C and Ku band. Thus, access to the Ka band through small FSS earth stations will be essential to the development of the GII. Indeed, over a decade ago, NASA recognized the potential for the Ka band when it committed nearly one billion dollars to the Advanced Communications Technology Satellite (ACTS) program. That program, which has been serving since September 1993 as a testbed for broadband FSS communications applications at Ka band, has clearly demonstrated the viability of this band for GII services.

B. Sufficient Spectrum Is Available Below 17.7 GHz to Meet Non-GSO MSS Feeder Link Needs

At the outset, Hughes acknowledges that non-GSO MSS satellite systems need sufficient feeder link spectrum in order to operate. Hughes believes, however, that the allocation and assignment of non-GSO feeder link frequencies should be done in a manner that maximizes the use of the available spectrum by all satellite services. In particular, Hughes supports the Commission's proposal to require reverse band working ("RBW") for feeder link transmissions below 17.7 GHz. RBW represents an extremely efficient use of spectrum, especially for non-GSO MSS systems that are unable to share their feeder link assignments with GSO FSS systems.

Hughes urges the Commission to support the allocation below 17.7 GHz of sufficient spectrum to meet the needs of all of the U.S. "Big LEO" proponents and not to propose any changes to the existing 20/30 GHz FSS allocations.^{3/} Hughes believes that the bands below 17.7 GHz should be the bands of "first" resort for non-GSO MSS feeder links, in order to keep the Ka band available for use by GSO FSS systems that use the spectrum more efficiently than non-GSO systems. Significantly, not one of the Big LEO applicants has identified any technological reason why it cannot use these bands below 17.7 GHz for feeder links. Only Motorola, which has steadfastly resisted proposals to share the Ka band

^{3/} In the Second NOI, the Commission has identified 1475 MHz of spectrum for RBW feeder link downlink use and 1350 MHz of spectrum for RBW feeder link uplink use. This exceeds the 1225 MHz of bandwidth that the U.S. Big LEO applicants have requested, even without considering their ability to use less feeder link spectrum by sharing it with each other. Moreover, since their current conditional licenses do not assign any specific feeder link frequencies, the Commission has full flexibility to require operators such as Motorola and TRW to amend their initial feeder link requests.

with other systems, clings tenaciously to the Ka band as the only "acceptable" location for its feeder links.

The inherent inefficiencies of the proposed non-GSO MSS systems mandate that their spectrum needs not forestall the development of GSO systems that will use the Ka band. In contrast to the current non-GSO proposals, each of which has made an unsubstantiated claim for an exclusive 200 or 300 MHz feeder link assignment, any GSO system that complies with the Commission's decade-old 2° spacing policy would allow that same 200 or 300 MHz of spectrum to be reused at each of the 180 orbital slots around the world. GSO systems could effectively turn 200 MHz into 36,000 MHz of useful spectrum, shared among numerous systems. However, absent adoption of some sharing criteria, the assignment of the same 200 or 300 MHz of feeder link spectrum to one non-GSO MSS system would provide that system with a "monopoly" over use of that spectrum throughout the world.^{4/} This approach is unprecedented and the need to be assigned this much spectrum on an exclusive basis has not been validated.

C. Codirectional Ka Band Feeder Links Should Be Permitted Only In Conjunction With the Adoption of GSO Sharing Criteria

If the Commission determines that some portion of the Ka band must be made available for non-GSO MSS feeder links, Hughes urges the Commission to base its proposals for WRC-95 on the specific and important conclusion of TG 4/5 that sharing between GSO FSS and non-GSO MSS feeder links is "feasible with certain constraints." Indeed, when TG

^{4/} In this regard, Motorola already has been granted exclusive rights to a portion of the L band frequencies below 1626.5 MHz, and, absent the adoption of some sharing criteria, the grant of an additional exclusive primary allocation of 500 MHz in each direction for Ka band feeder links would result in an exclusive, world-wide assignment of a significant amount of the spectrum resources below 30 GHz to only one or two United States satellite operators.

4/5 considered the use of the Ka band for feeder links, an essential underlying assumption was that GSO FSS systems and non-GSO MSS feeder links could share the spectrum on a codirectional, cofrequency basis. This assumption is critical in light of the pressing need to use the Ka band for expansion FSS services, as described above.

As presently proposed, none of the U.S. Big LEO systems would be able to fully share feeder link spectrum with a GSO system, because none wishes to implement the types of operational constraints that TG 4/5 and IWG 4 recognized as essential to sharing.^{5/} TG 4/5 finished its work in December with the acknowledgment that certain aspects of its report that involve sharing required further study. Indeed, the scope of the work of TG 4/5 and IWG 4 has been limited in the following manner:

- (1) Studies to date have not provided adequate insight into the magnitude of the interference-mitigating measures that can be applied to make sharing possible between GSO and non-GSO systems;
- (2) Most studies have been limited to examining compatibility between two discrete systems, and have not extended their analysis to other systems; and
- (3) Very little consideration has been given to differences between various proposed non-GSO systems and how the unique requirements of each system affect its ability to share.

In an effort to further develop the work of TG 4/5, over the past few months Hughes has sponsored and reviewed several spectrum sharing studies for the specific U.S. GSO FSS and non-GSO MSS feeder link systems proposed for the 30/20 GHz bands. While

^{5/} Both TG 4/5 and IWG 4 recognized that co-directional sharing of the Ka band between GSO FSS systems and non-GSO MSS feeder links would be possible only with the implementation of "interference reduction mechanisms" by feeder link operators. IWG 4 Report at § 4.1. See also TG 4/5 Report at 17 ("Codirectional sharing [at bands above 17.7 GHz] requires the Non-GSO/MSS feeder link network to take certain actions to reduce interference to and from GSO/FSS networks"); Second NOI at 21 ("appropriate constraints" needed for co-directional sharing between GSO FSS and MSS feeder link networks).

non-GSO MSS feeder link applicants may desire to avoid any obligation to be compatible with and protect GSO FSS systems, Hughes's sharing studies validate and extend the TG 4/5 conclusion that sharing between GSO FSS systems and non-GSO MSS feeder link systems is feasible with certain constraints. Hughes' studies demonstrate that generic inter-service sharing criteria can be developed to reduce or eliminate the need for detailed inter-system coordination between GSO and non-GSO systems.^{6/} For these reasons, Hughes encourages the Commission to adopt a position that uses sharing criteria as the basis for introducing new satellite systems, and that resorts to coordination as a refinement that addresses minor residual elements of incompatibility. Specifically, the Hughes studies show that in all cases (including the worst-case) interference can be reduced to an acceptable level by means of: (1) satellite diversity or earth station diversity; (2) path diversity; (3) exclusion zones; (4) carrier frequency offsets that still yield some frequency overlap and efficient frequency reuse; and/or (5) polarization discrimination. The first two of these mitigation methods are possible to implement with the current Iridium and TRW system designs. Hughes believes that this proposal would have little or no impact on Iridium and TRW and would maintain the required system availabilities. In addition, these constraints, if implemented, would guard against unreasonable consumption of Ka band orbit and spectrum resources by non-GSO MSS feeder link systems.^{7/}

Hughes has drawn the following conclusions from its recent sharing studies:

^{6/} See IWG-4 Docs. 54 and 59, which provide examples of possible sharing constraints.

^{7/} The means identified in Hughes' studies for achieving frequency sharing between GSO FSS and non-GSO MSS feeder link networks fundamentally are no more imposing than the criteria for sharing among GSO FSS networks. Thus, there is absolutely no reason why non-GSO MSS feeder link networks should not be required to make efficient, shared use of the spectrum.

- (1) The degree of incompatibility between GSO and non-GSO systems of certain classes has been greatly overstated.
- (2) Pragmatic measures using available resources that are already contemplated for most proposed non-GSO systems can be used to either mitigate incompatibility between systems entirely or to achieve levels of service availability that are entirely acceptable (i.e., similar to, or better than, those produced by rain outage).
- (3) Generic criteria can be proposed which will allow the initial non-GSO systems that are proposed in a given band segment to coexist on an equitable basis with new systems that are introduced in the future.
- (4) While all classes of non-GSO systems may not be made compatible by one set of generic compatibility criteria, band segmentation should be a last resort to accommodate exceptions where the need for the service outweighs the loss of spectrum and where no other means can be used to achieve similar service objectives.^{8/}
- (5) Coordination, as it is known in the GSO FSS services, would be adopted as a measure of resolving only those residual elements of incompatibility that cannot be handled by the general constraints that are established by the generic criteria.

While none of these operational constraints can be obtained without non-GSO MSS systems implementing some operational or hardware complexities, Hughes believes that these complexities clearly are warranted in order to achieve an efficient and equitable use of the spectrum. In particular, adopting some type of sharing criteria will ensure that more than the first few new non-GSO Ka band systems will be able to use that scarce resource.

^{8/} One of the more significant conclusions from these studies is that low Earth orbit systems such as Motorola's IRIDIUM are potentially easier to coordinate with GSO systems than the mid-Earth orbit ("MEO") systems like TRW's Odyssey. The reason is that the higher orbits of the MEO systems increase the duration and frequency of the couplings between the GSO and the non-GSO systems. In other words, to the extent that sharing is possible between non-GSO and GSO systems, the Motorola system presents much greater flexibility for the application of interference mitigation and avoidance techniques than the TRW system.

In sum, the Hughes studies performed to date conclude that sharing between non-GSO and GSO systems is possible if certain operational constraints are implemented. The implementation of these types of measures will maximize the use of the Ka band by both GSO and non-GSO systems.

D. The Protections Intended By RR 2613 Should Be Maintained

In the Second NOI, the Commission has requested comment on the continued applicability of RR 2613, and on proposals that will assure non-GSO systems that their use of the band will not be disrupted by a subsequently launched GSO system. In its proposals to make available 500 MHz of the Ka band for feeder links, the Commission has proposed deleting the protection intended by RR 2613, and requiring instead that affected systems comply with certain coordination and notification procedures.

Hughes agrees with the Commission's objective of maintaining maximum flexibility in the international allocations and regulatory procedures adopted at WRC-95 in order to avoid unnecessary constraints on in-orbit satellite systems. However, Hughes does not believe that this objective requires the elimination of RR 2613 or its equivalent from the portions of the Ka band that are under consideration for co-directional sharing with GSO FSS. Indeed, Iridium and Odyssey are designed to comply with RR 2613 (i.e. via orbit avoidance and path diversity, respectively) and RR 2613 would be rendered moot by successful coordination with other systems. Eliminating RR 2613's protection without adopting an alternative protective mechanism will remove any requirement that non-GSO systems use assigned frequencies efficiently and share spectrum in the manner in which they are capable.

The issue of GSO and non-GSO satellite system compatibility has been debated for many years without satisfactory resolution. Thus far, the most significant measure taken on this issue has been the adoption of RR 2613, which provides that non-GSO satellite systems should cease or reduce their emissions when they would interfere with GSO satellite systems. While various international study groups have determined that this provision, in its current form, is difficult if not impossible to enforce, the policy behind this provision is still relevant: there is a need to protect GSO satellite services and also allow co-primary use of the spectrum by non-GSO services to the maximum extent possible.

Hughes is concerned about the proposal to delete the protections to GSO FSS systems intended by RR 2613 because it would remove the incentive for non-GSO systems to maximize use of the spectrum by incorporating and exercising the technical means to avoid interference to GSO FSS systems. Essentially, deleting 2613 would create a first-come-first-served regime in which non-GSO systems would have absolutely no obligation to implement any of the interference reduction mechanisms that would allow the successful operation of subsequently launched GSO systems. While this type of a first-come first-served approach has been successful to date for GSO FSS systems, it would provide an inefficient and inequitable means for spectrum allocation and sharing with and among newly evolving non-GSO systems. The reason is that the "Big LEO systems" as currently proposed make it difficult if not impossible for GSO systems and other non-GSO systems to share the spectrum on a co-directional basis.

The Commission has adopted certain standards that are designed to ensure that GSO systems make maximum use of the orbital arc. For example, domestic FSS GSO satellites must be spaced at 2° intervals, earth stations are required to meet certain sidelobe

criteria in order to enjoy interference protection, and C band satellites are required to employ a certain frequency and polarization plan. While these criteria impose certain design limitations on satellites and earth stations and increase the costs of satellite systems, they provide an important benefit by effectively increasing the amount of spectrum that is available to FSS systems.

Absent RR 2613 or some other operational constraints on non-GSO systems, there is no reason for a non-GSO system to utilize its frequencies in an efficient manner, or in any manner that allows the spectrum to be used by other systems. As set forth above, based on its sharing studies to date, Hughes believes that the type of protection to GSO FSS systems provided under RR 2613 need not have a significant impact on the design and performance of non-GSO MSS systems. As previously noted, although neither TRW nor Motorola proposes to use these mechanisms for GSO interference reduction, each company's proposed feeder link network already possesses the system architecture and the technical means to implement the interference avoidance requirements of RR 2613.

In light of these developments, if the Commission determines to support the adoption of allocations for co-directional MSS feeder links at Ka band, the Commission should support the adoption of a footnote that refers to generic sharing criteria and an applicable MSS feeder link coordination procedure in appropriate sized uplink and downlink sub-bands.^{2/} In lieu of the Ka band proposals specified in paragraph 49 of the Second NOI, Hughes proposes the following formulation:

^{2/} Studies have shown that two Ka band non-GSO MSS feeder link systems can share the same frequencies. See, e.g., US CPM-95 document titled "In-Line Interference Between the Feederlinks of Non-GSO MSS Constellations," dated 24 February 1995. The Commission is considering a range of 200-500 MHz for Ka band feeder links, depending on whether sharing is possible among non-GSO systems.

ADD 730D Use of the bands [XXXX] and [XXXX] by feeder links for MSS networks using non-geostationary satellites is subject to the coordination provisions of Resolution No. 46 [suitably modified to allow for an opportunity for inter-service sharing]. The latest ITU-R Recommendations should be modified and consulted for applicable criteria for sharing between networks that use geostationary and non-geostationary satellites and subsequent coordination should occur only where residual incompatibility remains.

Thus, Hughes believes that it is premature and unnecessary to eliminate the protections intended by RR 2613. Instead, Hughes believes that the best way to protect both GSO and non-GSO systems from interference and maximize use of the spectrum is to develop and adopt generic sharing criteria to govern interservice sharing among satellite systems.

While it will not be possible to finalize these sharing criteria in time for the CPM, Hughes believes that it is important that work in this regard continue during the next few months before U.S. proposals to WRC-95 are due.^{10/} Hughes is prepared to continue its efforts and work with other applicants to identify means by which non-GSO and GSO systems can share the spectrum in a manner that maximizes use of limited radio frequencies.

Thus far no domestic forum has adequately addressed the issue of compatibility between GSO and non-GSO systems (including feeder links).^{11/} In order to

^{10/} As the Commission is aware, although TG 4/5 worked diligently on the feeder link sharing issue, it completed its report with the acknowledgement that more studies were needed.

^{11/} While the issue of feeder link compatibility of Ka band was to be addressed in the second phase of the 28 GHz Negotiated Rulemaking, timing constraints and a continued focus on satellite/LMDS issues did not allow those negotiations to occur.

develop the necessary sharing criteria between GSO and non-GSO systems, it is essential that further studies and discussions occur among affected system proponents. Hughes therefore encourages the Commission to instruct either IWG-4 or an ad hoc group of affected parties to be convened to refine these proposals, and also encourages the Commission to take an active role in structuring and supervising the work of that group. Hughes believes that this approach will allow the Commission to develop an appropriate position at WRC-95 on the use of the Ka band that would likely have greater international support than the currently proposed position.

In sum, Hughes believes that the following issues should be addressed both domestically and internationally in preparation for WRC 95:

(1) The feeder link requirements of the U.S. "Big LEO" systems should be justified and validated, particularly before any actions are taken that would provide those systems with a "monopoly" over use of part of the Ka band.

(2) Spectrum sharing of the increasingly scarce Ka band should be investigated and sharing criteria should be developed that will allow non-GSO MSS feeder links to share the spectrum on a co-frequency, co-directional basis with GSO FSS systems, non-GSO FSS systems, and other MSS feeder links.

(3) The burdens on system cost and operational complexity that will result from any sharing proposal need to be analyzed and equitably allocated between GSO and non-GSO systems. In particular, it appears that the current TRW and Motorola system designs already are able to accommodate some of the types of sharing methods discussed above, and future non-GSO MSS systems seeking to use the Ka band should be expected to include similar methods as well.

Hughes urges the Commission to support a position at WRC-95 in which RR 2613 would be in force throughout the 30/20 GHz bands until generic criteria to govern interservice sharing are defined and agreed upon. In no event should the U.S. support applying the converse of RR 2613 in a manner that makes GSO systems secondary in any band.^{12/}

E. The 29.5-30.0 and 19.7-20.2 GHz Bands Should be Excluded From Further Consideration

Hughes also urges the Commission to follow the recommendation of TG 4/5 and remove from any further consideration for non-GSO MSS feeder links the frequency bands 19.7-20.2 and 29.5-30.0 GHz. Those frequency bands are uniquely suited to support ultra-small earth terminals: the bands are not shared with any terrestrial services and offer maximum flexibility to deploy large networks of terminals that do not require any prior coordination. TG 4/5 quickly rejected a proposal to consider these bands for feeder links and the Commission should do the same. While these benefits clearly would be advantageous to a GSO FSS service, they would likely be unavailable if non-GSO MSS feeder links were authorized in these bands.

F. Proposals for WRC 95 Must Be Harmonized with Pending Domestic Spectrum Proceedings

While Hughes supports the Commission's objective of accommodating the spectrum needs of non-GSO MSS feeder links, it is essential that the position of the United States at CPM-95 and WRC-95 not prejudge the outcome of the current 28 GHz rulemaking proceeding in CC Docket No. 92-297.

^{12/} For example, the "second option" described in the draft CPM Report, Section 3.5.1 at 52 incorporates the converse of RR 2613.

As the Commission is aware, it now has pending a number of proposals for use of the Ka band that appear to be mutually exclusive. As currently proposed, the Hughes Spaceway system, Teledesic, Motorola and TRW feeder links, and LMDS cannot all share the Ka band. Pending the resolution of the 28 GHz proceeding, the Commission needs to maintain the flexibility to accommodate each of these applications.

The generic sharing criteria approach that Hughes has outlined above would be consistent with this goal, because it may provide a means to solve some of these conflicts, but would not prevent the grant of any of these proposals. In contrast, other Ka band proponents have recommended that the U.S. adopt a band segmentation scheme that would make GSO FSS systems secondary in part of the Ka band. Hughes strongly opposes any such proposal because it would prejudge the outcome of the 28 GHz proceeding.

III. 13.75 GHz Issues

In order to correct an imbalance in the spectrum that was available for FSS uplinks and downlinks, WARC-92 adopted a co-primary allocation for the FSS service in the 13.75-14.0 GHz band. This band is an important and natural expansion band for the FSS services, and numerous new satellite systems propose its use. Thus, it is critical to the competitiveness of the U.S. satellite industry, both at home and abroad, that the Commission adopt a position that supports primary GSO FSS use of the 13.75-14.0 GHz band.

In particular, Hughes supports the Commission's draft proposal No. 4/SS, which would amend footnotes 855A and 855B to the international table of frequency allocations. The criteria in those footnotes are essential to allow the sharing of this band by the FSS and other services and have been endorsed by ITU-R Task Groups 4/4 and 7/3. Hughes notes that the plans for its Galaxy VIII(I) satellite are compatible with these technical

requirements and urges the Commission to continue to support allocation of this band to the FSS.

Significantly, this band is not part of the Commission's current list of candidate feeder link bands. Hughes understands that IWG 4 recently decided not to recommend this band as a possible band for feeder links because of the constraints that such use would place on other services in this band. Hughes supports these decisions and urges the Commission not to consider this band as a possible candidate for non-GSO MSS feeder links.

IV. Appendices 30 and 30 A

With one qualification, Hughes fully endorses the IAC recommendations listed in paragraph 80 of Second NOI with respect to Appendices 30 and 30A. While the IAC recommends that the United States not oppose the adoption of new inter-regional sharing criteria, there are a few issues raised with the proposal to adopt inter-regional sharing criteria that warrant particular attention.

First, the existing inter-regional sharing criteria are based in part on the reference antenna patterns that were used as a basis for planning the BSS bands. These patterns will almost certainly be modified in revising the Regions 1 and 3 Plans; therefore, at a minimum, the sharing criteria will have to be changed to reflect those modifications.

Second, in adopting new inter-regional sharing criteria, Hughes strongly recommends that the United States follow the IAC recommendation "to protect Region 2 assignments as implemented." Hughes believes that protecting Region 2 systems as implemented is essential in order to protect the significant investments that United States BSS operators have made in their systems to date. In seeking to protect these implemented

systems, the United States should take into account the following factors, which underlie the concerns of the IAC expressed in paragraph 79 of the Second NOI:

- a) In revising the Appendices 30/30A Plans for Regions 1 and 3 at WRC 97 (and in preparations for those revisions at WRC 95), Region 2 assignments are entitled only to the same level of protection that they receive under the current Plans. (See Second NOI at paragraph 77 and footnote 112).
- b) The level of protection presently accorded to Region 2 assignments is based on the values of satellite EIRP and receiver antenna beam width associated with those assignments in the original Region 2 Plan.
- c) The U.S. BSS systems implemented so far (DIRECTV, USSB) employ significantly lower satellite EIRP and wider receiver antenna beam widths than the Region 2 Plan values. They are correspondingly more vulnerable to interference than they would be if they conformed to the Plan values.
- d) These U.S. BSS systems were implemented under the "Interim System Procedures" of Resolution No. 42 (Rev. Orb-88) of the Radio Regulations. This Resolution specifies that "Region 2 interim system assignments shall not obtain protection from, or cause harmful interference to, new or modified assignments appearing in the Region 1 and 3 Plans. . . ." ^{13/} Likewise, "The assignments of interim systems shall not be taken into account in applying the procedure of Article 6 or Article 7 of Appendix 30 (Orb 85). . . and the corresponding Articles in Appendix 30A (Orb 88)." ^{14/} The net effect of these factors is that, in revising Appendices 30 and 30A for Regions 1 and 3, the Administrations of those Regions are not obligated to protect U.S. systems as implemented, nor to adopt inter-regional sharing criteria that would do so.

In light of these factors, Hughes believes that there is only one certain method to provide interference protection of the U.S. systems in the face of the proposed revisions to the Region 1 and 3 Plans at WRC-97: seek permanent modifications to the U.S.

^{13/} Resolution 42, Section 3.

^{14/} Articles 6 and 7 are the coordination procedures for terrestrial and FSS systems, respectively. See Resolution 42, Sec. 2.